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EXAMINER	
MANOSKEY, JOSEPH D	

ART UNIT	PAPER NUMBER
2113	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/667,127	HINSHAW ET AL.	
	Examiner	Art Unit	
	Joseph D. Manoskey	2113	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24,27-46,49-51,57,58,60 and 63* is/are rejected.

7)☒ Claim(s) *25,26,47,48,52-56,59,61 and 62* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 February 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2/2/04 & 11/12/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

2. Claim 16 is objected to because of the following informalities: In claim 16, on the third line it is believed that the word "or" should be "of". For the purposes of further examination it will be interpreted as such. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claim 29 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The specification does not enable "wherein the probability of a double failure of both a processing assembly in the first set and a processing assembly in the second set within a given period of time is less than the probability of a double failure of two processing assemblies in the first set or the probability of a double failure of two processing assemblies in the second set within the same period of time".

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claims 1-21, 27-40, 49, 57, and 58 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanai et al., U.S. Patent 5,544,347, hereinafter referred to as "Yanai", in view of Morris, U.S. Patent 6,654,862.

7. Referring to claim 1, Yanai teaches a disk mirroring system with two data storage systems each attached to there own host, this is interpreted as a disk mirroring apparatus comprising two or more processing assemblies (See Fig. 1 and Col. 2, lines 35-47). Yanai teaches a host attached to the data storage system which contains a controller, this is interpreted as a processing unit, further comprising one or more general purpose processors, a memory, one or more disk controllers and a network

interface (See Fig. 1, and Col. 4, lines 6-20). Yanai discloses the data storage system containing disk drives, this is interpreted as a disk coupled to the processing unit (See Fig. 1, and Col. 4, lines 17-20).

Yanai does not teach the storage of disk being logically divided into at least two data segments, wherein a first data segment of a first disk in a first processing assembly is mirrored by a secondary data segment of a second disk in a second processing assembly, however Yanai does teach the data storage system containing a primary volume and a secondary volume, the secondary volume being a copy of the other storage systems primary volume, across a plurality of storage devices (See Fig. 1, and Col. 5, lines 10-30) and Yanai also teaches a desire to keep the cost of the system lower (See Col. 3, lines 41-43). Morris teaches storage subsystem that divides mirrored disks into at least two extents for storing primary and copies, where the copy is stored on the other disk (See Fig. 5, Col. 2, lines 40-46 and Col. 3, lines 5-12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine mirroring storage system of Yanai with the shared mirroring of disks of Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it provides a more effective use of disk-storage capacity at significant cost-saving (See Morris, Col. 4, lines 48-51).

8. Referring to claim 2, Yanai and Morris disclose all the limitations (See rejection of claim 1) including in which the processing assemblies further comprise additional disks coupled to the processing unit of the processing assembly, each disk logically divided

into at least two segments, wherein a first data segment of each of the plurality of additional disks in a first processing assembly is mirrored by a secondary data segment of one of the plurality of additional disks in a second processing assembly. Morris teaches each disk having primary data stored on first disk in a first section and a backup stored on another disk in a second section for every disk (See Fig. 5 and Col. 3, lines 5-12).

9. Referring to claim 3, Yanai and Morris teach all the limitations (See rejection of claim 1) including in which the disk is logically divided into at least three data segments, wherein data in a third data segment is not mirrored. Yanai teaches the storage devices containing a local volume for data that is only accessed locally (See Col. 5, lines 31-34).

10. Referring to claim 4, Yanai and Morris disclose all the limitations (See rejection of claim 3) including in which a choice can be made about whether a new data item is to be mirrored or not mirrored by specifying whether the new data item is to be stored in first data segment or a third segment. Yanai teaches the storage devices having a primary volume that is copied to the second volume of another storage device and a third volume for data that is only accessed locally (See Col. 5, lines 10-34).

11. Referring to claim 5, Yanai and Morris teach all the limitations (See rejection of claim 1) including a plurality of host computers that request modifications to data stored on the disk of a processing assembly by communicating with the processing unit of the

processing assembly via its network interface. Yanai teaches multiple host communicatively coupled to the system (See Fig. 1 and Col. 4, lines 6-11).

12. Referring to claim 6, Yanai and Morris disclose all the limitations (See rejection of claim 5) including wherein the modification requested by one of the host computers on the disk of a first processing assembly are also automatically performed on the disk of a second processing assembly, without intervention from the host computer. Yanai discloses real-time copying of data to the secondary data storage which is performed automatically and is transparent to the host (See Col. 6, lines 38-41).

13. Referring to claim 7, Yanai and Morris teach all the limitations (See rejection of claim 6) including wherein the processing assembly stores the data requested by the host computer in the first data segment of its disk and forwards the data to the processing unit of the second processing assembly to mirror the data on the secondary data segment of its disk. Yanai teaches the primary data storage controlling the copying of data to the secondary data storage system to which is communicatively coupled (See Fig. 1 and Col. 6, lines 38-41). Morris teaches the system being a database management system (See Col. 4, lines 23-25).

14. Referring to claim 8, Yanai and Morris disclose all the limitations (See rejection of claim 7) including wherein the processing unit of the second processing assembly receives the data that was forwarded by the processing unit of the first processing

assembly, and writes the data to the secondary data segment of its disk. Yanai discloses the data copied into the secondary volume of the secondary data storage after the primary data storage transfer it (See Fig. 1 and Col. 5, lines 23-30 and Col. 6, lines 38-41).

15. Referring to claim 9, Yanai and Morris teach all the limitations (See rejection of claim 1) including a mirror manager that manages mirroring of a block of data in the first segment of its disk into the secondary data segment of the disk of a second processing assembly. Yanai teaches the primary data storage system controlling the copying to the secondary storage (See Fig. 1 and Col. 6, lines 38-41).

16. Referring to claim 10, Yanai and Morris disclose all the limitations (See rejection of claim 9) including wherein the mirror manager manages mirroring of one or more database records in the first data segment of its disk into the secondary segment of the disk of a second processing assembly. Yanai teaches the primary data storage system controlling the copying of data to the secondary data storage system where the data is stored in the secondary volume (See Fig. 1 and Col. 5, lines 23-30 and Col. 6, lines 38-41).

17. Referring to claim 11, Yanai and Morris disclose all the limitations (See rejection of claim 9) including wherein the mirror manager operates autonomously from any host computer. Yanai discloses real-time copying of data to the secondary data storage

which is performed automatically and is transparent to the host (See Col. 6, lines 38-41).

18. Referring to claim 12, Yanai and Morris teach all the limitations (See rejection of claim 7) including wherein the processing unit of the second processing assembly may defer writing data to the secondary data segment of its disk unit it receives a commit command. Yanai teaches a second mode for copying which is asynchronous and waits for i/o completion signal (See Col. 6, lines 16-37).

19. Referring to claim 13, Yanai and Morris disclose all the limitations (See rejection of claim 1) including a storage manager, wherein the storage manager assigns logical block which map to disk tracks having the fastest data transfer time to the first data segment of its disk and also assigns logical blocks which map to disk tracks having a slower data transfer time to the secondary data segment of its disk. Morris teaches using a "short-stroking" that confines data to the outer tracks to reduce distance traveled by the mechanical arm ad reduce average seek time (See Col. 1, lines 25-32 and Col. 3, lines 24-27).

20. Referring to clam 14, Yanai and Morris disclose all the limitations (See rejection of claim 13) including wherein the assignment of blocks to segments is made once by the storage manager when the processing assembly is first made available for use.

Morris discloses allocating the data without any information about the data to be stored (See Col. 3, lines 33-43).

21. Referring to claim 15, Yanai and Morris teach all the limitations (See rejection of claim 13) including wherein the assignment of blocks to segments made by the storage manager may occur dynamically in response to data storage requests, such that blocks are allocated in the first data segment in response to a request to store data in the first data segment and blocks are allocated in the secondary data segment in response to a request to store a mirror copy of the data in the secondary data segment. Morris discloses allocating the data with knowledge of the characteristics of the data to be stored and thus allocates accordingly (See Col. 3, lines 33-43).

22. Referring to claim 16, Yanai and Morris teach all the limitations (See rejection of claim 1) including wherein the secondary data segment of the disk of the second processing assembly is a logical mirror of the first data segment of the disk of the first processing assembly. Morris teaches that the copies are mirror copies but are stored at different relative positions (See Col. 3, lines 9-13).

23. Referring to claim 17, Yanai and Morris disclose all the limitations (See rejection of claim 1) including a system manager, wherein the system manger controls the distribution map so as to evenly distribute data between the disks. Morris teaches the

system spreading the primary and mirror extents evenly among the disks (See Col. 4, lines 60-64).

24. Referring to claim 18, Yanai and Morris teach all the limitations (See rejection of claim 17) including wherein the system manager runs on a plurality of host computers. Yanai teaches multiple hosts connected to the system (See Fig. 1).

25. Referring to claim 19, Yanai and Morris disclose all the limitations (See rejection of claim 1) including wherein a first segment of the disk of the second processing assembly is mirrored in a secondary data segment of the disk of the first processing assembly. Morris teaches each disk having primary data stored on the disk in a first section and a backup stored on another disk in a second section for every disk (See Fig. 5 and Col. 3, lines 5-12).

26. Referring to claim 20, Yanai and Morris disclose all the limitations (See rejection of claim 1) including wherein a first segment of the disk of the second processing assembly is mirrored in a secondary data segment of disk of a third processing assembly. Morris teaches each disk having primary data stored on first disk in a first section and a backup stored on another disk in a second section for every disk (See Fig. 5 and Col. 3, lines 5-12). Morris also teaches the system including more than two disks (See Col. 5, lines 5-7).

27. Referring to claim 21, Yanai and Morris teach all the limitations (See rejection of claim 1) including wherein the first data segment of the disk of the first processing assembly is mirrored in secondary data segments of the disks of two or more processing assemblies. Morris teaches more than one mirror extent and spreading them evenly among the disks in the mirrored set (See Col. 4, lines 60-64).

28. Referring to claim 27, Yanai and Morris disclose all the limitations (See rejection of claim 1) including wherein the plurality of processing assemblies is subdivided into at least two sets. Yanai teaches the primary and the secondary storage system being removed geographically from each other (See Col. 4, lines 66-67).

29. Referring to claim 28, Yanai and Morris teach all the limitations (See rejection of claim 27) including wherein the first segments of disks in a first set of processing assemblies are mirrored in secondary data segments of disks in a secondary set of processing assemblies, and wherein first data segments of the disks in the second set of processing assemblies are mirrored in secondary data segments of the disks in the first set of processing assemblies. Yanai teaches the primary storage system storing its backup copy in the secondary data storage system (See Col. 2, lines 35-47).

30. Referring to claim 29, Yanai and Morris teach all the limitations (See rejection of claim 28) including wherein the probability of a double failure of both a processing assembly in the first set and a processing assembly in the second set within a given

period of time is less than the probability of a double failure of two processing assemblies in the first set or the probability of a double failure of two processing assemblies in the second set within the same period of time. Yanai teaches the two systems being geographically removed from each other so that in the event of a disaster complete data recovery is possible since only one site will be affected and not both (See Col. 5, lines 1-10).

31. Referring to claim 30 Yanai and Morris disclose all the limitations (See rejection of claim 30) including wherein the processing assemblies in the different sets are powered separately. Yanai discloses the two system geographically removed from each other, thus each system must have their own power supply (See Col. 5, lines 1-10).

32. Referring to claim 31, Yanai and Morris teach all the limitations (See rejection of claim 28) including wherein each set of processing assemblies is served by a separate network switch to which the network interfaces of the processing units of the processing assemblies in that set are coupled. Yanai teaches the storage systems each having their own connection to the hosts (See Fig. 1).

33. Referring to claim 32, Yanai teaches a method for a disk mirroring system with two data storage systems each attached to there own host, this is interpreted as a method for disk mirroring in a system of multiple disks coupled to multiple processing

units (See Fig. 1 and Col. 2, lines 35-47). Yanai teaches hosts attached to the data storage systems which contains a controller (See Fig. 1, and Col. 4, lines 6-20). Yanai discloses the data storage system containing disk drives (See Fig. 1, and Col. 4, lines 17-20). Yanai also teaches a primary volume on a primary data storage system and a secondary copy volume being a copy of on the secondary storage system, this is interpreted as writing, by a first processing unit, the first data to a second processing unit and forwarding, by the first processing unit, the first data to a second processing unit (See Fig. 1, and Col. 5, lines 10-30).

Yanai does not teach writing, by the second processing unit, the first data to a secondary segment of a second disk coupled to the second processing unit, however Yanai does teach the data storage system containing a primary volume and a secondary volume, the secondary volume being a copy of the other storage systems primary volume, across a plurality of storage devices (See Fig. 1, and Col. 5, lines 10-30) and Yanai also teaches a desire to keep the cost of the system lower (See Col. 3, lines 41-43). Morris teaches storage subsystem that divides mirrored disks into at least two extents for storing primary and copies, where the copy is stored on the other disk (See Fig. 5, Col. 2, lines 40-46 and Col. 3, lines 5-12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine mirroring storage system of Yanai with the shared mirroring of disks of Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it provides a more effective use of disk-storage capacity at significant cost-saving (See Morris, Col. 4, lines 48-51).

34. Referring to claim 33, Yanai and Morris disclose all the limitations (See rejection of claim 1) including writing, by the second processing unit, second data to a first segment of the disk coupled to the second processing unit, forwarding, by the second processing unit, the second data to an other processing unit, and writing, by the other processing unit, the second data to a secondary segment of a disk coupled to the other processing unit. Morris teaches each disk having primary data stored on the disk in a first section and a backup stored on another disk in a second section for every disk (See Fig. 5 and Col. 3, lines 5-12).

35. Referring to claim 34, Yanai and Morris teach all the limitations (See rejection of claim 32) including wherein mirroring is performed by the multiple processing units under direction of a mirror manager. Yanai teaches the primary data storage system controlling the copying to the secondary storage (See Fig. 1 and Col. 6, lines 38-41).

36. Referring to claim 35, Yanai and Morris disclose all the limitations (See rejection of claim 32) including assigning, by a storage manager, logical blocks which map to disk tracks having the fastest data transfer time to the first segment of the first disk; and assigning, by the storage manager, logical blocks which map to disk tracks having a slower data transfer time to the secondary segment of the first disk. Morris teaches using a "short-stroking" that confines data to the outer tracks to reduce distance traveled

by the mechanical arm ad reduce average seek time (See Col. 1, lines 25-32 and Col. 3, lines 24-27).

37. Referring to claim 36, Yanai and Morris teach all the limitations (See rejection of claim 32) including wherein the secondary segment of the second disk is a logical mirror of the first data segment of the first disk. Morris teaches that the copies are mirror copies but are stored at different relative positions (See Col. 3, lines 9-13).

38. Referring to claim 37, Yanai and Morris disclose all the limitations (See rejection of claim 32) including distributing, by a system manager, data between disks. Morris teaches the system spreading the primary and mirror extents evenly among the disks (See Col. 4, lines 60-64).

39. Referring to claim 38, Yanai and Morris teach all the limitations (See rejection of claim 37) including wherein the step of distributing data comprises reassigning blocks in a distribution map. Yanai teaches maintaining a list or index of the data in the storage system (See Col. 7, lines 32-42).

40. Referring to claim 39, Yanai and Morris disclose all the limitations (See rejection of claim 37) including wherein the step of distributing data between disks is performed in case of a fail-over. Yanai discloses having the primary and secondary copies in case of a failure (See Col. 4, line 66 to Col. 5, line 10).

41. Referring to claim 40, Yanai and Morris disclose all the limitations (See rejection of claim 32) including forwarding, by the first processing unit, the first data to a third processing unit and writing, by the third processing unit, the first data to a secondary segment of a disk coupled to the third processing unit. Morris teaches each disk having primary data stored on first disk in a first section and a backup stored on another disk in a second section for every disk (See Fig. 5 and Col. 3, lines 5-12). Morris also teaches the system including more than two disks (See Col. 5, lines 5-7).

42. Referring to claim 49, Yanai and Morris disclose all the limitations (See rejection of claim 32) including subdividing the plurality of disks into at least two sets of disks, wherein first segments of disks in a first set of disks are mirrored in secondary segments of disks in a second set of disks, and wherein first segments of the disks in the second set of disks are mirrored in secondary segments of the disks in the first set of disks. Yanai teaches the primary and the secondary storage system being removed geographically from each other (See Col. 4, lines 66-67). Yanai teaches the primary storage system storing its backup copy in the secondary data storage system (See Col. 2, lines 35-47).

43. Referring to claim 57, Yanai teaches a method for disk mirroring system with two data storage systems each attached to there own host that allows for failover, this is interpreted as a method for fail-over processing in a system of multiple disks coupled to

multiple processing units (See Fig. 1, Col. 2, lines 35-47, and Col. 6, lines 46-51). Yanai teaches hosts attached to mirrored data storage systems which uses a primary and second volume, this is interpreted as maintaining by a first and second processing unit a mirror of a first disk in a second disk (See Fig. 1, and Col. 4, lines 6-20). Yanai also discloses in the failure of the primary the secondary data storage can be used in its place and Yanai teaches maintaining a list or index of the data in the storage system, this is interpreted as swapping, in case of a failure of the first disk or the first processing unit, data in a distribution map pointing to the first disk and the second disk and responding, by the second processing unit, to commands directed to data stored on the first disk using data stored on the second disk (See Col. 6, lines 46-51 and Col. 7, lines 32-42).

Yanai does not teach the storage of disk being divided into at least two data segments, wherein a first data segment of a first disk in a first processing assembly is mirrored by a secondary data segment of a second disk in a second processing assembly, however Yanai does teach the data storage system containing a primary volume and a secondary volume, the secondary volume being a copy of the other storage systems primary volume, across a plurality of storage devices (See Fig. 1, and Col. 5, lines 10-30) and Yanai also teaches a desire to keep the cost of the system lower (See Col. 3, lines 41-43). Morris teaches storage subsystem that divides mirrored disks into at least two extents for storing primary and copies, where the copy is stored on the other disk (See Fig. 5, Col. 2, lines 40-46 and Col. 3, lines 5-12).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine mirroring storage system of Yanai with the shared mirroring of disks of Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it provides a more effective use of disk-storage capacity at significant cost-saving (See Morris, Col. 4, lines 48-51).

44. Referring to Claim 58, Yanai and Morris teach all the limitations (See rejection of claim 57) including wherein command directed to data stored on first segments of the multiple disks are broadcast to the multiple processing units. Yanai teaches using a primary data storage system and in the event of an outage of the primary data storage system then using a the secondary data storage system(See Col. 6, lines 46-51).

45. Claims 22-24, 41-46, 50, 51, 60, and 63 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yanai and Morris in view of Jones et al., U.S. Patent App. Pub. 2002/0156971, hereinafter referred to as "Jones".

46. Referring to claim 22, Yanai and Morris teach all the limitations (See rejection of claim 1) except a spare processing assembly is activated by a system manager upon detecting failure of the disk or the processing unit of one of the plurality of processing assemblies, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive (See page 2,

paragraph 0025). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the spare drive of Jones with the mirroring system of Yanai and Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

47. Referring to claim 23, Yanai, Morris, and Jones disclose all the limitations (See rejection of claim 22) including a second processing unit transmits to the processing unit of the processing assembly data stored in a secondary data segment of the disk coupled to the second processing unit, this secondary data segment having been a mirror of a first data segment of the disk of the failed processing assembly; and the processing unit of the spare processing assembly stored the data it receives from the second processing unit in the first data segment of the disk of the spare processing assembly. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

48. Referring to claim 24, Yanai, Morris, and Jones teach all the limitations (See rejection of claim 22) including a processing unit of a first processing assembly transmits to the processing unit of the spare processing assembly the data store in a first data segment of the disk coupled to the first processing unit, this first data segment having been mirrored by the secondary data segment of the disk of the failed

processing assembly; and the processing unit of the spare processing assembly stores the data it receives from the first processing unit in the secondary data segment of the disk of the spare processing assembly. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

49. Referring to claim 41, Yanai and Morris teach all the limitations (See rejection of claim 32) except rebuilding, incase of a processing unit failure, data on a disk associated with the failed processing unit using a spare processing unit, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive the lost data is rebuilt (See page 2, paragraph 0025). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the spare drive of Jones with the mirroring system of Yanai and Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

50. Referring to claim 42 Yanai, Morris, and Jones disclose all the limitations (See rejection of claim 41) including wherein the step of rebuilding further comprises rebuilding data stored on a first segment of the disk coupled to the failed processing unit, using a secondary data segment corresponding to the first data segment of the

disk coupled to the failed processing unit. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

51. Referring to claim 43, Yanai, Morris, and Jones teach all the limitations (See rejection of claim 41) including wherein the step of rebuilding further comprises rebuilding data stored on a secondary segment of the disk coupled to the failed processing unit using a primary data segment corresponding to the secondary data segment of the disk coupled to the failed processing unit. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

52. Referring to claim 44, Yanai and Morris teach all the limitations (See rejection of claim 32) except rebuilding, in case of a disk failure, data on a spare disk, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive the lost data is rebuilt (See page 2, paragraph 0025). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the spare drive of Jones with the mirroring system of Yanai and Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because in the event of a failure of a drive in the mirror

system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

53. Referring to claim 45 Yanai, Morris, and Jones disclose all the limitations (See rejection of claim 44) including wherein the step of rebuilding further comprises rebuilding data on a first segment of the spare disk using a secondary data segment corresponding to the first data segment of the failed disk. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

54. Referring to claim 46, Yanai, Morris, and Jones teach all the limitations (See rejection of claim 45) including wherein the step of rebuilding further comprises rebuilding data on a secondary segment of the spare disk using a first data segment corresponding to the secondary data segment of the failed disk. Jones teaches the new drive replacing the failed drive and having the lost data automatically rebuilt on it (See Jones, page 2, paragraph 0025).

55. Referring to claim 50, Yanai and Morris teach all the limitations (See rejection of claim 32) except rebuilding, in case of a sector failure on the first segment of the first disk, the failed sector using a corresponding sector on the secondary segment of the second disk, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10). Jones teaches RAID system that is a

hybrid of mirroring and striping, and a failed drive is replaced with a new drive and having the lost data automatically rebuilt on it (See page 2, paragraph 0025). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the spare drive of Jones with the mirroring system of Yanai and Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

56. Referring to claim 51, Yanai and Morris teach all the limitations (See rejection of claim 32) except rebuilding, in case of a sector failure on the secondary segment of the second disk, the failed sector using a corresponding sector on the first segment of the first disk, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive and having the lost data automatically rebuilt on it (See page 2, paragraph 0025). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the spare drive of Jones with the mirroring system of Yanai and Morris. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

57. Referring to claim 60, Yanai teaches a method for a disk mirroring system with two data storage systems each attached to there own host (See Fig. 1 and Col. 2, lines 35-47). Yanai teaches hosts attached to the data storage systems which contains a controller (See Fig. 1, and Col. 4, lines 6-20). Yanai discloses the data storage system containing disk drives (See Fig. 1, and Col. 4, lines 17-20). Yanai also teaches a primary volume on a primary data storage system and a secondary copy volume being a copy of on the secondary storage system (See Fig. 1, and Col. 5, lines 10-30).

Yanai does not teach the disks containing a first segment for data and secondary segment for mirrored data of another disk, however Yanai does teach the data storage system containing a primary volume and a secondary volume, the secondary volume being a copy of the other storage systems primary volume, across a plurality of storage devices (See Fig. 1, and Col. 5, lines 10-30) and Yanai also teaches a desire to keep the cost of the system lower (See Col. 3, lines 41-43). Yanai also does not teach rebuilding, incase of a disk failure, data on a disk associated with the failed processing unit using a spare processing unit, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10).

Morris teaches storage subsystem that divides mirrored disks into at least two extents for storing primary and copies, where the copy is stored on the other disk (See Fig. 5, Col. 2, lines 40-46 and Col. 3, lines 5-12). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive the lost data is rebuilt (See page 2, paragraph 0025).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine mirroring storage system of Yanai with the shared mirroring of disks of Morris and the spare drive of Jones. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it provides a more effective use of disk-storage capacity at significant cost-saving (See Morris, Col. 4, lines 48-51) and because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

58. Referring to claim 63, Yanai teaches a method for a disk mirroring system with two data storage systems each attached to there own host (See Fig. 1 and Col. 2, lines 35-47). Yanai teaches hosts attached to the data storage systems which contains a controller (See Fig. 1, and Col. 4, lines 6-20). Yanai discloses the data storage system containing disk drives (See Fig. 1, and Col. 4, lines 17-20). Yanai also teaches a primary volume on a primary data storage system and a secondary copy volume being a copy of on the secondary storage system (See Fig. 1, and Col. 5, lines 10-30).

Yanai does not teach the disks containing a first segment for data and secondary segment for mirrored data of another disk, however Yanai does teach the data storage system containing a primary volume and a secondary volume, the secondary volume being a copy of the other storage systems primary volume, across a plurality of storage devices (See Fig. 1, and Col. 5, lines 10-30) and Yanai also teaches a desire to keep the cost of the system lower (See Col. 3, lines 41-43). Yanai also does not teach rebuilding, incase of a processing unit failure, data on a disk associated with the failed

processing unit using a spare processing unit, however Yanai and Morris do teach mirroring of data which is used for data recovery (See Yanai, Col. 5, lines 3-10).

Morris teaches storage subsystem that divides mirrored disks into at least two extents for storing primary and copies, where the copy is stored on the other disk (See Fig. 5, Col. 2, lines 40-46 and Col. 3, lines 5-12). Jones teaches RAID system that is a hybrid of mirroring and striping, and a failed drive is replaced with a new drive the lost data is rebuilt (See page 2, paragraph 0025).

It would have been obvious to one of ordinary skill in the art at the time of the invention to combine mirroring storage system of Yanai with the shared mirroring of disks of Morris and the spare drive of Jones. This would have been obvious to one of ordinary skill in the art at the time of the invention to do because it provides a more effective use of disk-storage capacity at significant cost-saving (See Morris, Col. 4, lines 48-51) and because in the event of a failure of a drive in the mirror system it allows the system to be rebuilt to recover the data (See Jones, page 2, paragraph 0025).

Allowable Subject Matter

59. Claims 25, 26, 47, 48, 52-56, 59, 61, and 62 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

60. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following are other closely related mirroring systems.

U.S. Patent 6,681,290 to Brower, Jr. et al.

U.S. Patent App. Pub. 2001/0051955 to Wong

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph D. Manoskey whose telephone number is (571) 272-3648. The examiner can normally be reached on Mon.-Fri. (7:30am to 4pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Beausoliel can be reached on (571) 272-3645. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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JDM

August 23, 2005

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